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Madagotricha ranomafanae gen. et sp. n., first member of the *Heterotricha* group (Diptera: Sciaroidea) from Madagascar

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ABSTRACT

A new genus and a new species of Sciaroidea *incertae sedis*, *Madagotricha ranomafanae* gen. et sp. n., are described from Madagascar. This genus is classified within the *Heterotricha* group of genera that is not affiliated to any sciaroid family of the currently accepted system. Within this group, *Madagotricha* is the closest relative of the East African genus *Kenyatricha* Chandler.

KEY WORDS: Diptera, Sciaroidea *incertae sedis*, *Madagotricha*, new genus, new species, Madagascar.

INTRODUCTION

Within the superfamily Sciaroidea, the *Heterotricha* group forms a group of genera that cannot be assigned to any of the traditionally recognised families. Delimitation of this group from other Sciaroidea *incertae sedis* varies among different authors, as well as among the same authors applying different assumptions to their cladistic analyses (Chandler 2002; Hippa & Vilkamaa 2005, 2006; Amorim & Rindal 2007). In our opinion, which agrees with one tree topology of two obtained by Hippa and Vilkamaa (2005: fig. 2), a monophyletic *Heterotricha* group is formed by all the genera ending with *-tricha*: *Afrotricha* Chandler, 2002 (Afrotropical); *Anisotricha* Chandler, 2002 (New Zealand); *Chiletricha* Chandler, 2002 (Neotropical); *Heterotricha* Loew, 1850 (fossil Baltic amber, extant Palaearctic); *Insulatricha* Jaschhof, 2004 (New Zealand); *Kenyatricha* Chandler, 2002 (Afrotropical); *Nepaletricha* Chandler, 2002 (Oriental); and *Rhynchoheterotricha* Freeman, 1960 (Afrotropical). The Neotropical genus *Eratomyia* Amorim & Rindal, 2006, which, in our opinion, is only doubtfully distinct from *Chiletricha*, also belongs to this group. Adult morphology provides sufficient evidence to show that the *Heterotricha* group results from a very early radiation of the Sciaroidea—presumably the same radiation that led to the genesis of large sciaroid families, such as the Mycetophilidae and Sciaridae.

The majority of extant *Heterotricha*-like taxa are found in the Southern Hemisphere. Three of the eight genera occur exclusively in the Afrotropical Region: *Kenyatricha* in the East African mountains, and *Afrotricha* and *Rhynchoheterotricha* in South Africa. According to the phylogenies proposed by Chandler (2002) and Hippa and Vilkamaa (2005: fig. 2, 2006), these genera belong to three different lineages: *Kenyatricha* and *Nepaletricha* are sister groups; so are *Afrotricha* and *Heterotricha*, and *Rhynchoheterotricha* and *Chiletricha*. These results suggest straightforward biogeographic affinities between Afrotropical species and Oriental, Palaearctic and Neotropical elements. Intra-Afrotropical relationships between genera of the *Heterotricha* group have not yet been shown, which is not surprising considering that the Afrotropical fauna of the Sciaroidea is only fragmentarily known, and poorly sampled and studied even at the generic level (Barraclough & Londt 1985).

Our recent study of Malaise samples from Madagascar revealed the presence of the *Heterotricha* group even in this isolated part of Gondwana. One of the two species found is represented by a single female and cannot be assigned to any known genus, owing to its peculiar set of characters (e.g., moderately extended proboscis, very short vein *ta*, unmodified terminalia, and presence of two sclerotised spermathecae). We mention this specimen here to encourage dipterists working in Madagascar to pay special attention to *Heterotricha*-like flies, in particular when sampling in montane forests. The other species, named here as *Madagotricha ranomafanae* gen. et sp. n., appears to be most closely related to *Kenyatricha* from the neighbouring African continent. The aim of this paper is to describe and discuss the relationships of this new species, thereby expanding knowledge of the intriguing Diptera fauna of Madagascar (Irwin *et al*. 2003).

MATERIAL AND METHODS

Specimens were picked from a Malaise sample taken by the Madagascar Malaise Trapping Network and deposited with the California Academy of Sciences Collections (CASC). This sample, out of a total of 32 arthropod samples, was screened for various Sciaroidea during a visit to the laboratory of Dr Michael E. Irwin at the National Soybean Research Center, University of Illinois, Urbana-Champaign, in February 2005.

Specimens were mounted on microscope slides in Canada balsam after a brief treatment with an ethanol/formaldehyde mixture and treatment with beechwood creosote over several hours. The holotype and five paratypes are deposited in CASC in San Francisco, and two paratypes are kept in the Jaschhof Collection in the Zoological Institute and Museum in Greifswald (ZIMG). For light microscope study and the preparation of drawings we used an Olympus BX50 microscope in combination with the U-DA drawing unit. Morphological terminology follows Søli (1997).

TAXONOMY

Genus **Madagotricha** gen. n.

Etymology: Based on the occurrence of the type species in Madagascar and its relationship with the *Heterotricha* group.

Type species: *Madagotricha ranomafanae* sp. n.

Diagnosis: Characters that indicate affiliation of *Madagotricha* with the *Heterotricha* group are: veins *tb* and *mcu* long and horizontal, CuA1 arising from *tb*+*mcu* (and not from a common stem with CuA2), and the postphragma large and protruding into the abdominal cavity. Generally similar to *Kenyatricha* and *Nepaletricha* in vein *ta* being absent, but distinguished by largely reduced mouthparts, particularly the very short maxillary palpi; R1 ending before the level of M fork that is shorter than M stem; R5 strongly curved; and male genitalic structures, like the gonocoxites with a large membranous portion ventrally, and simple gonostyli.

Description (based on male, female unknown):

Head (Fig. 1A): Head capsule subglobular; setation rather short and sparse. Postfrons non-setose. Frontal tubercle two-pointed. Face small, non-setose. Clypeus subtriangular, situated in basal incision of face; setose. Antennae inserted near midheight of head, shorter than body. Scape and pedicel subequal in size. Scape ventrally setose. Pedicel

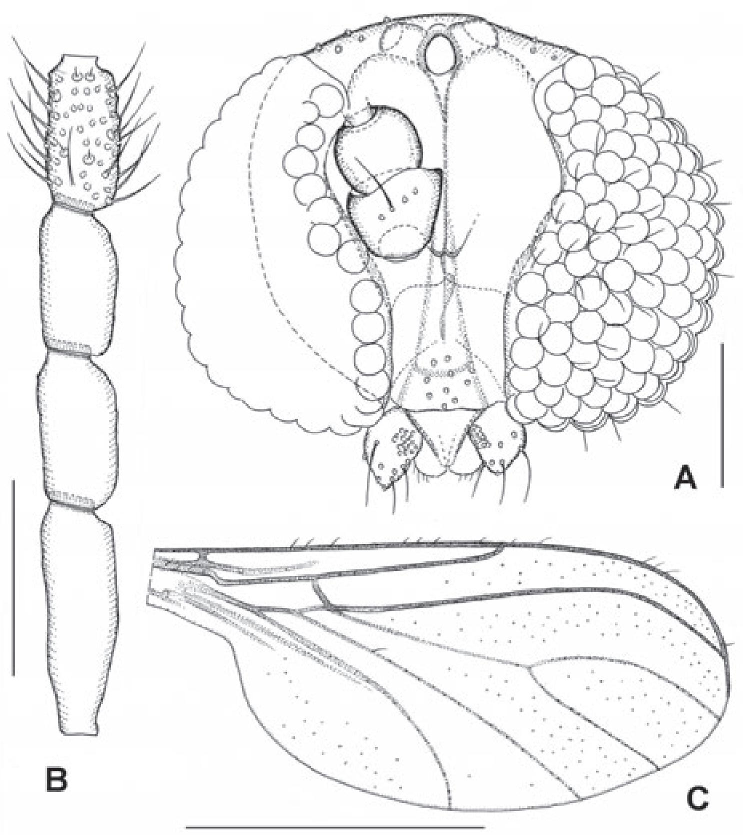

Fig. 1. *Madagotricha ranomafanae* sp. n., male: (A) paratype, head, frontal view; (B) paratype, antennal flagellomeres 1–4, lateral view; (C) holotype, wing, dorsal view. Scale bars = 0.1 mm (A), 0.05 mm (B) and 1.0 mm (C).

dorsally setose. Fourteen flagellomeres; first flagellomere longer than subsequent flagellomeres; medial flagellomeres, including a short apical stem, twice as long as wide (Fig. 1B). Flagellomeres bearing non-socketed setae intermingled with sensory spines, longest setae shorter than corresponding flagellomere width (Fig. 1B); microtrichia restricted to base of first flagellomere. Three ocelli on vertex. Compound eyes reniform, widely separated on vertex. Ommatidia comparatively large, surrounded by 3 or 4 interommatidial setulae. Mouthparts weakly developed.

Thorax (Fig. 2): Scutum with irregular dorsocentral and lateral rows of setae. Antepronotum and proepisternum setose, other sclerites non-setose. Laterotergite rather flat. Mid-pleural pit well-developed. Legs long and slender, bearing short setae. Coxae long. Tibial spurs 1:2:2. Fore tibia lacking antero-apical depression. Mid and hind tibiae lacking apical comb of pale setae. Claws small, slightly curved, lacking teeth.

Wing (Fig. 1C): In all specimens, vein *ta* obliterated. Halter bearing setae on both stem and knob.

Abdomen: Sternite 1 non-setose, otherwise setose. Tergal plaques small, 1 on either side of tergites 2–6 in anterolateral position.

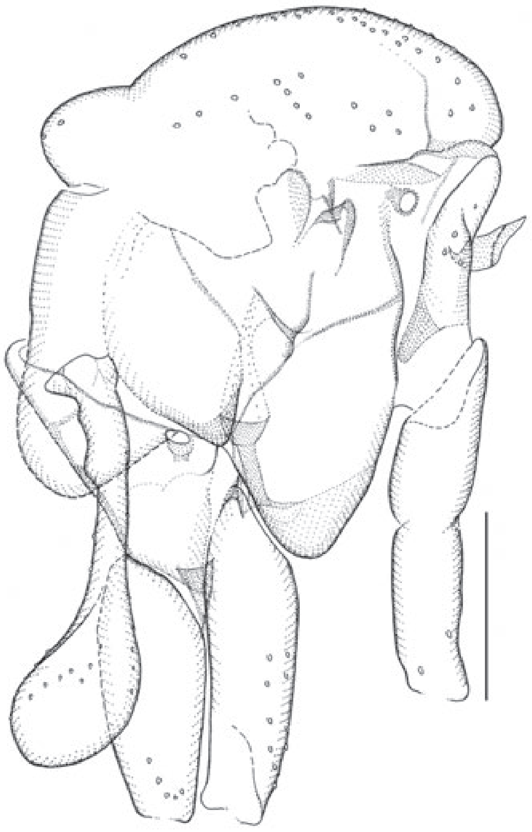

Fig. 2. *Madagotricha ranomafanae* sp. n., male holotype, thorax, lateral view. Scale bar = 0.2 mm.

Terminalia (Figs 3, 4): Sternite 9 present as distinct sclerite, covering non-setose portion of gonocoxites. Tergite 9 large, with strong convexity, apically with pair of rounded lobes bearing strong setae on ventral surface. Gonocoxites wider than long. Gonocoxal apodemes separate, with anterior portions long. Gonostylus rather small, simple, finger-shaped, pointing dorsally, with large basolateral apophysis. Parameres dorsally united, forming complicated sheath-like plate (tegmen). Parameral apodemes very short, broadly rounded. Aedeagus with rod-like apodeme, apically with complex three-dimensional structure. Cerci large, bearing large setae. Hypoproct smaller than cerci, bearing large microtrichia and 2 large setae on either half.

Madagotricha ranomafanae sp. n.

Figs 1–4

Etymology: From the type locality, Ranomafana.

Description:

Male.

Body size 2 mm.

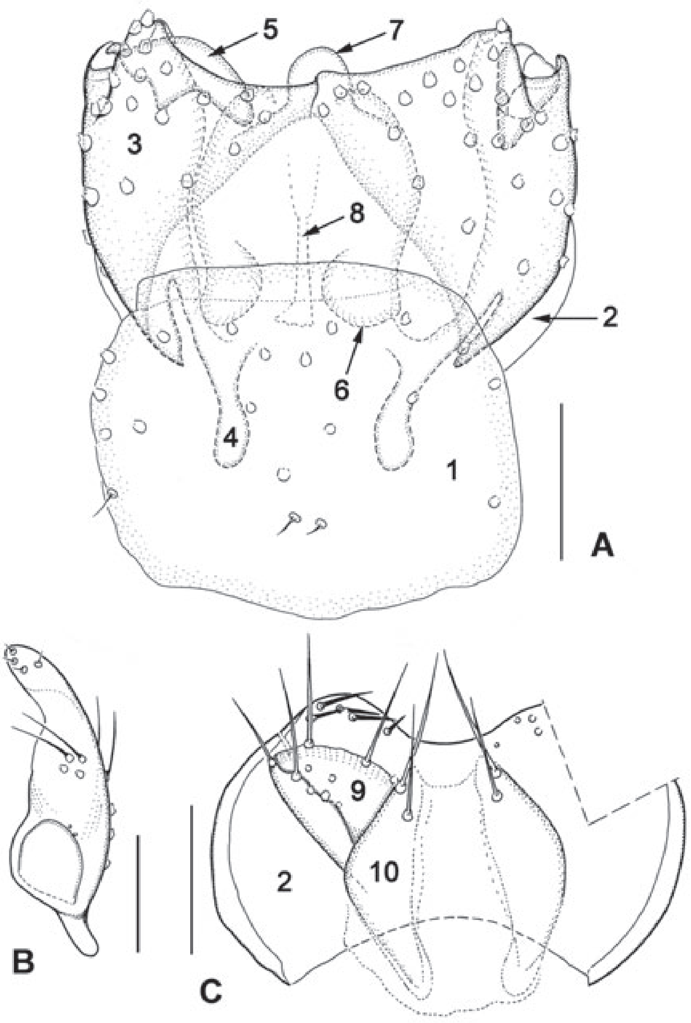

Fig. 3. *Madagotricha ranomafanae* sp. n., male paratypes: (A) terminalia, ventral view; (B) gonostylus, mesial view; (C) tergite 9, cerci and hypoproct, ventral view. Designations: 1 – sternite 9, 2 – tergite 9, 3 – gonocoxa, 4 – anterior portion of gonocoxal apodeme, 5 – gonostylus, 6 – parameral apodeme, 7 – medio-apical lobe of tegmen, 8 – aedeagus, 9 – cercus, 10 – hypoproct. Scale bars = 0.05 mm (A, C) and 0.03 mm (B).

Head (Figs 1A, B): Basal antennal flagellomeres as in Fig. 1B. Labrum short subtriangular, non-setose. Maxilla with lacinia not traceable. Maxillary palpus with 2 segments; first segment smooth, bearing 1 seta; second segment slightly larger than first, beet-shaped, bearing setae and on mesial surface short hyaline sensilla.

Thorax (Fig. 2): As for genus.

Wing (Fig. 1C): In two specimens seen, *sc–r* traceable as very pale vein, otherwise *sc–r* absent. Membrane rather sparsely covered with setae. R1 and R5 each apically with ventral setae; stem vein, Sc, R, R1, R5, M1, M2, CuA1, and CuA2 with dorsal setae.

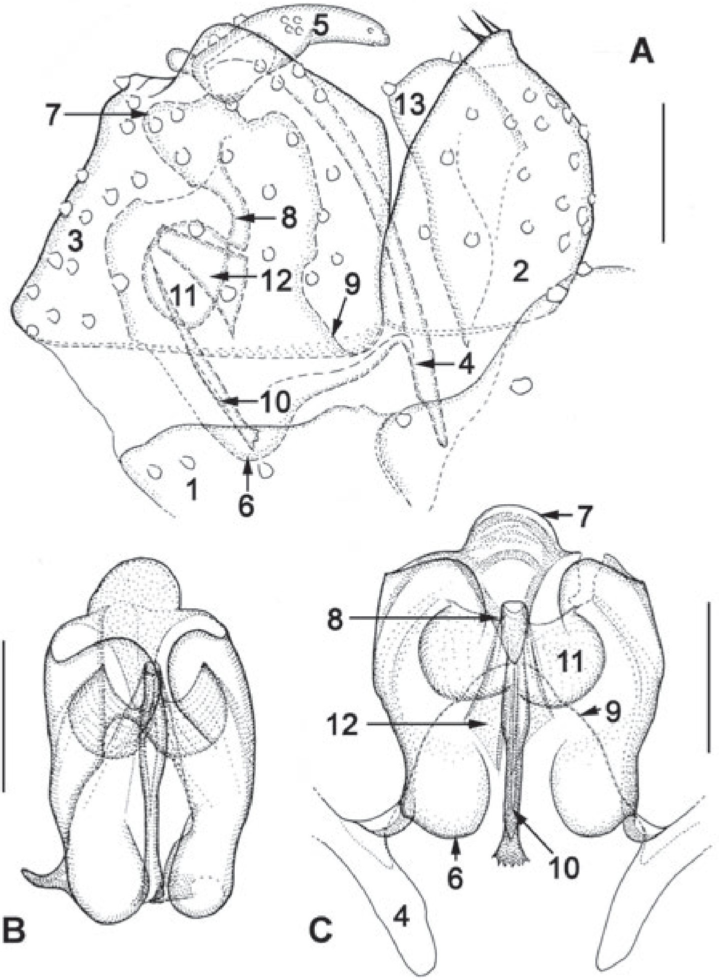

Fig. 4. *Madagotricha ranomafanae* sp. n., male paratypes: (A) terminalia, lateral view; (B) tegmen and aedeagus, ventrolateral view; (C) tegmen and aedeagus, ventral view. Designations: 1 – sternite 9, 2 – tergite 9, 3 – gonocoxa, 4 – anterior portion of gonocoxal apodeme, 5 – gonostylus, 6 – parameral apodeme, 7 – medio-apical lobe of tegmen, 8 – tegmen process, 9 – dorsobasal margin of tegmen, 10 – aedeagal apodeme, 11 – chamber-like structure, 12 – hood-like structure, 13 – cercus. Scale bars = 0.05 mm.

Terminalia: Sternite 9 large, subrectangular, setose (Fig. 3A). Tergite 9 setose, apical lobes ventrally each with 5–7 one-pointed setae (Fig. 3C). Gonocoxites apicolaterally with slight projections; ventral and lateral surfaces setose except a large membranous portion ventrobasally (Fig. 3A). Gonostylus curved, tapered in distal third, apically rounded and bearing a few setulae (Fig. 3B). Tegmen ventromedially separated throughout, broadly rounded on either side of a medial cleft; apically with strong, rounded lobe extending basally into narrow process (Figs 4B, C). Aedeagus ventro-apically with hood-like structure and latero-apically with chamber-like structure (Figs 4B, C).

Female. Unknown.

Holotype: ♂ MADAGASCAR: *Fianarantsoa Prov.*: Parc National Ranomafana, radio tower, 21°15'05"S: 47°24'43"E, alt. 1150 m, at edge of montane rainforest, 1–19.ix.2002, Malaise trap, R. Harin'Hala Hasinjaka & M.E. Irwin (CASC).

Paratypes: 7♂ same data as holotype (CASC, ZIMG).

DISCUSSION

The most striking feature of the wing venation in *Madagotricha* is the absence of *ta*, bringing the media and radius into close proximity. Clearly an apomorphous condition, this character was used to substantiate the sister-group relationship of *Kenyatricha* and *Nepaletricha* by both Chandler (2002) and Hippa and Vilkamaa (2005: fig. 2, 2006), and is the reason we assign *Madagotricha* to the same clade. According to Chandler (2002), *Kenyatricha* and *Nepaletricha* also correspond in the structure of the male genitalia, with the gonocoxites bearing setose lobes adjacent to the gonostyli. Gonocoxal lobes in the same position, even though much smaller, are also present in *Madagotricha*; this is further evidence for a close relationship between these genera. *Madagotricha* appears to be the sister group of *Kenyatricha*, based on the following shared characters: clypeus (termed face, or facial prominence by Chandler (2002)) is setose (bare in *Nepaletricha*); wings with the anal lobes weakly developed (strongly developed, almost rectangular); vein Sc ends at or before the level of Rs (far beyond Rs); and the ninth tergite with apical lobes bearing setae on the ventral surfaces (apical lobes bare). Arguments for the generic distinctness of *Madagotricha* are listed in the Diagnosis section.

By advocating the phylogenetic hypothesis as outlined above, we dismiss the phylogeny for the *Heterotricha* group as most recently proposed by Amorim and Rindal (2007). Their proposal for an expanded concept and reclassification of the family Rangomaramidae (which includes most of the *Heterotricha*-like genera) seems premature to us, adding to—rather than elucidating—the inconsistencies created by a number of previous hypotheses (see Hippa & Vilkamaa 2005, 2006).

As with many other *Heterotricha*-like taxa and other Sciaroidea *incertae sedis*, *Madagotricha ranomafanae* is apparently confined to the temperate conditions of the montane zone where the adults seem to have a relatively short flight period. The only specimen of another *Heterotricha*-like species in Madagascar (see Introduction) was captured by the same Malaise trap one month later than *Madagotricha*, which further supports this assertion.

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REFERENCES

AMORIM, D.S. & RINDAL, E. 2007. Phylogeny of the Mycetophiliformia, with proposal of the subfamilies Heterotrichinae, Ohakuneinae, and Chiletrichinae for the Rangomaramidae (Diptera, Bibionomorpha). *Zootaxa* **1535**: 1–92.

BARRACLOUGH, D.A. & LONDT, J.G.H. 1985. Order Diptera (Flies). *In*: Scholtz, C.H. & Holm, E., eds, *Insects of Southern Africa*. Durban: Butterworths, pp. 283–326.

CHANDLER, P. 2002. *Heterotricha* Loew and allied genera (Diptera: Sciaroidea): offshoots of the stem group of Mycetophilidae and/or Sciaridae? *Annales de la Société Entomologique de France* (*n.s.*) **38** (1–2): 101–144.

HIPPA, H. & VILKAMAA, P. 2005. The genus *Sciarotricha* gen. n. (Sciaridae) and the phylogeny of recent and fossil Sciaroidea (Diptera). *Insect Systematics & Evolution* **36**: 121–143.

———2006. Phylogeny of the Sciaroidea (Diptera): the implication of additional taxa and character data. *Zootaxa* **1132**: 63–68.

IRWIN, M.E., SCHLINGER, E.I. & THOMPSON, F.C. 2003. Diptera, True Flies. *In*: Goodman, S.M. & Benstead, J.P., eds, *The natural history of Madagascar*. Chicago: University of Chicago Press, pp. 692–702.

SØLI, G.E.E. 1997. The adult morphology of Mycetophilidae (s.str.), with a tentative phylogeny of the family (Diptera, Sciaroidea). *Entomologica Scandinavica Supplement* **50**: 5–55.